IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended): A parameter determination method of a template matching method for searching from a second image a matching area having the highest correlation with a template including a reference point in a first image from a second image, the template matching method comprising:

calculating, based on the first image, a difference between a corresponding point of the reference point in the second image corresponding to the reference point and an estimated point of the reference a calculated point in the second image which is calculated obtained by the template matching method; and

determining, based on the difference, at least one of parameters of the template matching, the parameters comprising a location of the reference point, a size of the template and resolutions of the first and second images based on the difference.

2. (Currently Amended): The method according to claim 1, wherein the difference comprises an upper bound of average distance between the corresponding point and the estimated calculated point.

3. (Original): The method according to claim 1, wherein the calculating comprises:

calculating non-similarity or similarity between a first area including the corresponding point of the second image and a second area to which the first area is moved within a predetermined searching area within the second image, and

finding the difference using a plurality of non-similarity or similarity calculated with respect to a plurality of the second areas within the searching area.

4. (Original): The method according to claim 1, wherein the determining comprising determining the reference point based on a reference candidate whose difference is minimum from a plurality of reference point candidates.

5. (Original): The method according to claim 1, wherein the determining comprises finding a maximum size of the template giving a smaller difference than a threshold value.

6. (Currently Amended): The method according to claim 1, wherein the determining comprises finding [[a]] minimum resolutions of the first and second images giving a smaller difference than a threshold value.

7. (Currently Amended): An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein, the computer readable program searching from a second image a matching area having the highest correlation with a template including a reference point in a first image from a second image, the computer readable program code means comprising:

computer readable program code means for causing a computer to calculate, based on the first image, a difference between a corresponding point of the reference point in the second image corresponding to the reference point and an estimated point of the reference a calculated point in the second image which is calculated obtained by [[the]] template matching method; and

computer readable program code means for causing a computer to determine, based on the difference, at least one of parameters of the template matching, the parameters

comprising <u>a location of</u> the reference point, a size of the template and resolutions of the first and second images ~~based on the difference~~.

8. (Currently Amended): An article of manufacture according to claim 7, wherein the difference comprises an upper bound of average distance between the corresponding point and the ~~estimated~~ <u>calculated</u> point.

9. (Original): An article of manufacture according to claim 7, wherein the computer readable program code means for causing a computer to calculate a difference calculates non-similarity or similarity between a first area including the corresponding point of the second image and a second area to which the first area is moved within a predetermined searching area within the second image, and finds the difference using a plurality of non-similarity or similarity calculated with respect to a plurality of the second areas within the searching area.

10. (Original): An article of manufacture according to claim 7, wherein the computer readable program code means for causing a computer to determine at least one of parameters determines the reference point based on a reference candidate whose difference is minimum from a plurality of reference point candidates.

11. (Original): An article of manufacture according to claim 7, wherein the computer readable program code means for causing a computer to determine finds a maximum size of the template giving a smaller difference than a threshold value.

12. (Currently Amended): An article of manufacture according to claim 7, wherein the computer readable program code means for causing a computer to determine finds [[a]]

minimum resolutions of the first and second images giving a smaller difference than a threshold value.

13. (Currently Amended): An image processing device for searching <u>from a second image</u> a matching area having the highest correlation with a template including a reference point in a first image <s>from a second image</s>, comprising:

a calculation unit configured<u>, based on the first I mage,</u> to calculate a difference between a corresponding point <s>of the reference point</s> in the second image <u>corresponding to the reference point</u> and <s>an estimated point of the reference</s> <u>a calculated</u> point which is <s>calculated</s> <u>obtained</u> by [[the]] template matching <s>method</s>; and

a determination unit configured to determine<u>, based on the difference,</u> at least one of parameters of the template matching, the parameters comprising <u>a location of</u> the reference point, a size of the template and resolutions of the first and second images <s>based on the difference</s>.

14. (Currently Amended): The device according to claim 13, wherein the difference comprises an upper bound of average distance between the corresponding point and the <s>estimated</s> <u>calculated</u> point.

15. (Original): The device according to claim 13, wherein the calculation unit comprises:

a calculation unit configured to calculate nonsimilarity or similarity between a first area including the corresponding point of the second image and a second area to which the first area is moved within a predetermined searching area within the second image, and

a finding unit configured to find the difference using a plurality of non-similarity or similarity calculated with respect to a plurality of the second areas within the searching area.

16. (Original): The device according to claim 13, wherein the determination unit determines the reference point based on a reference candidate whose difference is minimum from a plurality of reference point candidates.

17. (Original): The device according to claim 13, wherein the determination unit finds a maximum size of the template giving a smaller difference than a threshold value.

18. (Currently Amended): The device according to claim 13, wherein the determination unit finds [[a]] minimum resolutions of the first and second images giving a smaller difference than a threshold value.

19. (New): The method according to claim 2, wherein the calculating calculates the following upper bound u:

$$u = \sum_{e \in S} |e| P(e)$$

where, s is a searching range, e is an error vector, and P(e) is a probability that an error indicated by the error vector e is generated as a result of the template matching and is expressed as follows:

$$P(e) \le \exp\left\{ -\frac{1}{2} NE_{TM}(e) \right\}$$

where

$$E_{TM}(e) = \max_{0 < \rho < 1} E_{TM}(e, \rho),$$

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$$E_{TM}(\mathbf{e}, \rho) = R\left\{\gamma_2{}^2 \frac{\rho}{1+\rho} + \log(1-\rho^2)\right\} + (1-R)\gamma_1{}^2 \rho(1-\rho),$$

$$\gamma_1{}^2 = \frac{1}{|W_1|} \sum_{p \in W_1} \frac{\Delta^2(\mathbf{p}, \mathbf{e})}{\sigma^2}, \quad \gamma_2{}^2 = \frac{1}{|W_2|} \sum_{p \in W_2} \frac{\Delta^2(\mathbf{p}, \mathbf{e})}{\sigma^2}$$

where $W_1 = W(O) \cap W(e)$, $W_2 = W^c(O) \cap W(e)$, and $W_3 = W(O) \cap W^c(e)$,

W^c represents complement of W,

W(O) is a template having the corresponding point as the center, and

W(e) is an area displaced by the error vector e.

20. (New): The method according to claim 7, wherein the calculating calculates the following upper bound u:

$$u = \sum_{e \in S} |\mathbf{e}| P(\mathbf{e})$$

where, s is a searching range, e is an error vector, and P(e) is a probability that an error indicated by the error vector e is generated as a result of the template matching and is expressed as follows:

$$P(\mathbf{e}) \le \exp\left\{-\frac{1}{2} N E_{TM}(\mathbf{e})\right\}$$

where

$$E_{TM}(\mathbf{e}) = \max_{0 < \rho < 1} E_{TM}(\mathbf{e}, \rho),$$

$$E_{TM}(\mathbf{e}, \rho) = R\left\{\gamma_2{}^2 \frac{\rho}{1+\rho} + \log(1-\rho^2)\right\} + (1-R)\gamma_1{}^2 \rho(1-\rho),$$

$$\gamma_1{}^2 = \frac{1}{|W_1|} \sum_{p \in W_1} \frac{\Delta^2(\mathbf{p}, \mathbf{e})}{\sigma^2}, \quad \gamma_2{}^2 = \frac{1}{|W_2|} \sum_{p \in W_2} \frac{\Delta^2(\mathbf{p}, \mathbf{e})}{\sigma^2}$$

where $W_1 = W(O) \cap W(e)$, $W_2 = W^c(O) \cap W(e)$, and $W_3 = W(O) \cap W^c(e)$,

W^c represents complement of W,

W(O) is a template having the corresponding point as the center, and

W(e) is an area displaced by the error vector e.

21. (New): The method according to claim 13, wherein the calculating calculates the following upper bound u:

$$u = \sum_{e \in S} |e| P(\mathbf{e})$$

where, s is a searching range, e is an error vector, and P(e) is a probability that an error indicated by the error vector e is generated as a result of the template matching and is expressed as follows:

$$P(\mathbf{e}) \leq \exp\left\{-\frac{1}{2} NE_{TM}(\mathbf{e})\right\}$$

where

$$E_{TM}(\mathbf{e}) = \max_{0 < \rho < 1} E_{TM}(\mathbf{e}, \rho),$$

$$E_{TM}(\mathbf{e}, \rho) = R\left\{\gamma_2^2 \frac{\rho}{1+\rho} + \log(1-\rho^2)\right\} + (1-R)\gamma_1^2 \rho(1-\rho),$$

$$\gamma_1^2 = \frac{1}{|W_1|} \sum_{p \in W_1} \frac{\Delta^2(\mathbf{p}, \mathbf{e})}{\sigma^2}, \quad \gamma_2^2 = \frac{1}{|W_2|} \sum_{p \in W_2} \frac{\Delta^2(\mathbf{p}, \mathbf{e})}{\sigma^2}$$

where $W_1 = W(O) \cap W(e)$, $W_2 = W^c(O) \cap W(e)$, and $W_3 = W(O) \cap W^c(e)$,

W^c represents complement of W,

W(O) is a template having the corresponding point as the center, and

W(e) is an area displaced by the error vector e.